MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO: Commissioners Brown, Carlson, Barofsky, McRae and Schlossberg

FROM: Lisa Krentz, Electric Generation Manager; Mark Zinniker, Generation Engineering Supervisor; and Jeremy Somogye, Generation Engineering Planner IV

DATE: August 2, 2022

SUBJECT: Goal #3(a) Leaburg Canal TBL & Strategic Assessment Update

OBJECTIVE: Discussion / Direction

Issue

This memo provides an update on progress toward achieving the 2022 EWEB organizational goal #3a, *work in collaboration with the Board and the McKenzie Valley Community to set the direction of the* ***Leaburg Hydro Electric Project*** *toward either a power producing asset or a storm water conveyance asset. Specifically,* this memo provides updates to the Triple Bottom Line (TBL) analysis of EWEB's long-term options, as well as our near-term risk mitigation efforts.

Background

The Leaburg Canal has been operating as a stormwater conveyance facility since October 2018, when observations of internal erosion of the canal embankments prompted EWEB to dewater the canal and cease power generation until the dam safety issue could be resolved. Following subsequent findings that some canal embankments may also present earthquake safety risks, EWEB initiated a comprehensive risk assessment of the entire canal to better understand the level of investment that would be required to ensure long term safe and reliable operation. This assessment indicated that the necessary level of investment would be considerable and the Net Present Value (NPV) for the Leaburg Project would be substantially negative with less than 20 years remaining on the FERC operating license. Based on this understanding, pursuing a rapid return-to-service (RTS) was not considered appropriate in the short term. Instead, the Board directed staff to pursue near-term risk reduction measures for safe stormwater conveyance while, in parallel, performing a Triple Bottom Line (TBL - social, environmental, and economic) analysis of long-term options. The fundamental long-term (post 2040) options are to pursue a return-to-service/relicensing of the Project or move toward permanent decommissioning of the Project.

EWEB staff continue to advance the development of near-term risk reduction measures, which are needed to ensure safe operation until a long-term plan is implemented. We are working with the consultant team that performed the risk assessment, led by Cornforth Consultants. The consultant team is currently preparing the Drilling Program Plan (DPP), which is on target for completion in Q3 of 2022.

The proposed subsurface exploration locations were recently confirmed, and drilling is expected to begin in early 2023.

In order to provide the Board with information to make an informed selection on the most appropriate long-term path forward by the fourth quarter of 2022, EWEB staff retained a consulting team (led by GEI Consultants) to assist in developing detailed analyses of the social, environmental, and financial impacts of various scenarios. Progress on this effort is detailed in this memo.

Eleven alternatives were initially identified and ultimately narrowed to four options that will be fully evaluated using the TBL and key decision parameters. The four alternatives that have been selected for detailed TBL analysis and will be presented to the Board during subsequent progress updates are:

- **Alternative 1 – Decommission:** Return site to pre-project conditions
- **Alternative 2 – Return to Service:** Full facility restoration of existing power generation configuration
- **Alternative 3 – Return to Service:** New hydro powerhouse at Luffman Spillway and conversion to stormwater conveyance downstream of the proposed powerhouse
- **Alternative 4 – Decommission:** Combination of storm water conveyance (SWC) and return to pre-project conditions

Please see Appendix A for a more detailed description of the above alternatives, as well as the alternatives that were not selected for further evaluation.

Triple Bottom Line Process Overview

Staff have identified a comprehensive list of social, environmental, and economic issues to consider in the decision-making process. All four alternatives have both benefits and impacts in most areas, depending on the stakeholder's perspective and values. Therefore, weighing trade-offs is not straightforward and any option is likely to result in perceived inequity amongst the interested parties. There is not an option that will be preferred by all stakeholders.

During the Board Work Session on June 16, 2022, staff proposed providing a recommendation on TBL priorities based on staff and Subject Matter Expert professional opinion, as well as public input received from outreach efforts. This approach narrows the list of issues to those with the potential for greatest impact and enables the Board to focus on the subjects most likely to sway the decision, while still qualitatively capturing all stakeholder concerns and identifying potential mitigative actions. As of the drafting of the memo, the list is still in development, but we expect to provide that information during the August 2nd meeting. Following the August 2022 meeting, the Board will be provided with a sensitivity analysis tool to further evaluate the list of priority issues.

Financial Update

The consultant team and EWEB staff have developed initial cost estimates for the upfront capital investment needed for each of the four alternatives, which are used as inputs into the NPV. Costs for near-term risk reduction measures are integrated and apply to the upfront capital costs for all scenarios. A variety of additional financial considerations that affect the NPV results are also discussed in the following sections of this memo.

All four alternatives are currently in the feasibility assessment and study phase, creating significant cost uncertainty such that estimates will be in an expected range of -30% to +50% from baseline, in accordance with the American Association of Cost Engineering (AACE) Class 4 guidelines detailed in Table 1.

	Primary Characteristic	Secondary Characteristic		
Estimate Class	**Maturity Level of Project Definition Deliverables Expressed as % of complete definition**	**End Usage Typical Purpose of Estimate**	**Methodology Typical Estimating Method**	**Expected Accuracy Range Typical Variation in Low and High Ranges[1]**
Class 5	0% to 2%	Concept screening	Capacity factored, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Equipment factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Table 1: American Association of Cost Engineering Estimate Classes

Baseline cost estimates, including low and high ranges, for the four alternatives are shown below in Table 2. Estimates **include**, but are not limited to, the following categories, all of which fall into AACE Class 4:

- Subsurface Exploration & Feasibility Studies
- Legal and Administration
- Property and Water Right Acquisitions
- Permitting and Relicensing
- Design and Construction Planning
- Construction
- Post-Construction Oversight and Studies

Exclusions from the baseline capital cost include, but are not limited to:

- Inflation/Escalation after 2022 in excess of assumptions for EWEB's Long Term Financial Plan
- Unknown hazardous materials
- Unforeseen change in site conditions
- Contract constraint risk, to include but not limited to:
    - Fixed price contracts
    - Date certain contracts
    - Performance guarantee contracts

Baseline Capital Cost **Assumptions**:

- Typical May through November construction
- Overtime rates based on 50 hours per week
- Standard equipment rates, fuel, and maintenance cost
- Historically consistent crew and equipment productivity levels

Table 2: Baseline Cost Estimates and Expected Range			
Alternative	Baseline	-30%	+50%
1. Return to Pre-construction Conditions	$252,470,000	$176,729,000	$378,705,000
2. Full Facility Renewal	$257,860,000	$180,502,000	$386,790,000
3. New Powerhouse near Luffman Spillway; Canal Downstream Converted to Stormwater Conveyance	$179,100,000	$125,370,000	$268,650,000
4. Canal Converted to Stormwater Conveyance; Dam and Powerhouse removed	$184,600,000	$129,220,000	$276,900,000

Power Generation and Price Projections

Power generation revenues for both return to service (RTS) alternatives are based on forecasted market prices and historical production patterns for the Leaburg project with an assumption there will be a Cougar Reservoir flow regime change. Expected market prices, as well as high and low ranges, are shown below in Chart 1 and are based on Integrated Resource Plan (IRP) projections through December 2075.

Chart 1: Market Prices Over Time

Capital Spending Projections

In contrast to the timelines presented to the Board in June, construction duration and schedule of capital spending has been revised to reflect a similar timeline for all scenarios (RTS and Decommissioning), balancing the intensity of annual spending regardless of the alternative being pursued. During the June 16, 2022, Board Work Session, staff presented an aggressive 8-year return to service approach in order to benefit from generation revenue as soon as possible. However, upon further analysis, the intense annual spending was not justified by the overall rate of return. In addition, the feasibility of rapidly returning to service is uncertain and complicated by regulatory issues and adequately addressing stakeholder interests. The current proposal for all alternatives extends through the existing license period that ends in 2040, resulting in a slower and more extended average annual spending rate.

All scenarios will require extensive planning, regulatory compliance negotiations, and construction. Each scenario requires that near-term risk reduction measures, which are expected to be completed by 2028, are performed in parallel. Table 3 provides an overview of the assumed timelines. We expect an increase in capital spending beginning in 2031, correlating with final design and permitting efforts, followed immediately by intensive construction activities that will take approximately 6 years (Chart 2). It is assumed the RTS scenarios will have a slightly heavier pace of upfront spending for the additional design and planning effort, and the decommissioning scenarios will have the need for additional studies at the conclusion of the work due to extensive restoration efforts.

Table 3: Assumed Project Timeline: RTS and Decommissioning			
Decommissioning	**Assumed Schedule**	**Return to Service**	**Assumed Schedule**
Implementation of Near-Term Risk Reduction Measures	**2023-2027**	**Implementation of Near-Term Risk Reduction Measures**	**2023-2027**
License Surrender & Settlement Agreement Technical Studies	**2023-2027**	**License Amendment and Settlement Agreement studies**	**2023-2027**
FERC Approval, NEPA and ESA Process	**2028-2029**	**FERC Approval, NEPA and ESA Process**	**2028-2029**
Design & Permitting	**2030-2032**	**Design & Permitting**	**2030-2032**
Decommissioning Implementation & Closeout Studies	**2033-2040**	**Re-commissioning Implementation & Closeout Studies**	**2033-2040**

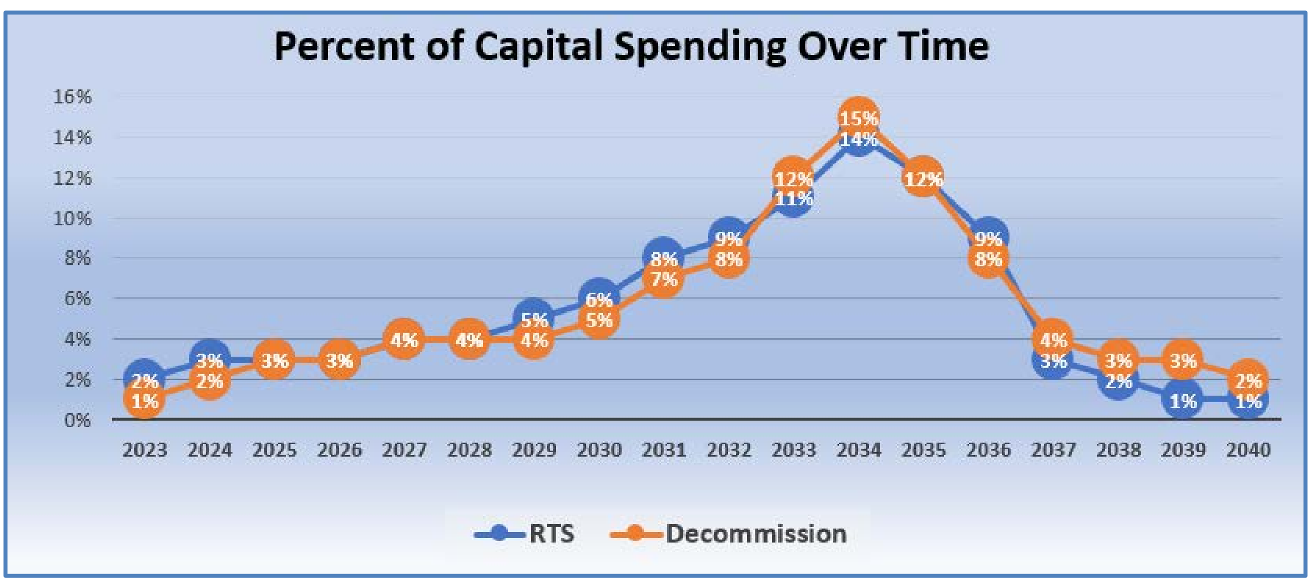


Chart 2: Percent of Capital Spending Over Time: RTS vs. Decommissioning

Net Present Value

For each of the four selected alternatives, the EWEB financial team is preparing the Net Present Value (NPV), essentially an estimate of "all-in" cost, for inclusion in the TBL. Primary NPV analysis inputs and assumptions are shown in Tables 4 and 5:

Table 4: Net Present Value Inputs				
Input to NPV ($ million)	**Alternative 1 – Decommission to Pre-Project**	**Alternative 2 – RTS to Existing Power Plant**	**Alternative 3 – RTS to New Power Plant**	**Alternative 4 – Decommission to SWC**
Initial Capital Cost[1]	$252,470,000	$257,860,000	$179,100,000	$184,600,000
Ongoing Capital Cost:[2]				
Normal Year (Annually)	$125,000	$282,000	$230,000	$215,000
Major Improvements (5-yr)	$400,000	$1,474,000	$1,100,000	$923,000
Annual O&M Cost[3]	$870,000	$1,450,000	$1,305,000	$1,085,000
Annual Generation[4]	0 MWh	95,800 MWh	37,400 MWh	0 MWh
Annual Generation with Cougar Flow Regime[5]	0 MWh	87,400 MWh	34,300 MWh	0 MWh
Average Annual Power Prices:[6]				
Expected	$0	$33.00	$33.00	$0
High	$0	$61.00	$61.00	$0
Low	$0	$14.00	$14.00	$0
Expected REC Value[7,8]	$0	$4.50	$4.50	$0
Expected Carbon Value[7,8]	$0	$3.75	$3.75	$0
Expected Capacity Value[7,9]	$0	$9.00	$4.00	$0

[1] Estimated baseline costs for each alternative.

[2] Estimated costs for equipment replacement and renewal, as necessary to maintain reliability.

[3] Annual labor, material, and support service costs.

[4] Estimated hydroelectric power production value based on historical patterns for Leaburg Project. Rounded to nearest hundred.

[5] NPV analysis considers the current Cougar Flow Regime.

[6] Forecasted market pricing, in Dollars per MWh, based on Integrated Resource Plan (IRP) projections, from November 2036 through December 2076. Rounded to nearest dollar.

[7] Estimated values based on IRP projections.

[8] Expected Renewable Energy Credit (REC) and Carbon Values in Dollars Per MWH. Based on IRP projections.

[9] Expected Capacity Value in Dollars per KW. Based on IRP projections.

Additional underlying NPV assumptions for all alternatives:

Table 5: NPV Assumptions for all Alternatives	
Escalation Rates:	
O&M Labor	3.0%
Non-labor Escalation	2.0%
Capital Escalation	3.0%
Capacity Value Escalation (nominal output)	2.1%
Discount Rates:	
Nominal Dollars	6.3%
Uninflated Dollars	4.2%
Historical Inflation Rate[1]	2.1%

[1] Based on historical inflation – Bureau of Labor Statistics headline inflation rate (average 2018-2021)

The REC and carbon values are analyzed using theoretical (shadow) carbon prices to include the low, medium, and high REC prices multiplied by the baseline Leaburg generation output. This assumes a return to service date in late 2036 and generation that extends through 2075. The REC, carbon, and capacity values are not included in the baseline NPV results but will be presented in the context of forthcoming additional sensitivity analyses.

The NPV analysis also considers the potential impact of a change in flow regime at Cougar Reservoir that could reduce generation output of either RTS alternative compared to historic conditions. An increase in minimum instream flow obligations (currently 1,000 cubic feet per second) that may be required under a new license is not reflected but will be considered in upcoming sensitivity analyses.

Preliminary expected wholesale market price and retail market price NPV results are shown below in Chart 3. The underlying detail for the net present value of projected power revenues, ongoing O&M and capital expenses, and upfront capital expenses are shown in the subsequent tables and charts. The expected NPV captures the baseline assumptions without additional sensitivities being considered, and the retail NPV considers the revenue generated by direct power sales to EWEB customers rather than sales to the wholesale market.

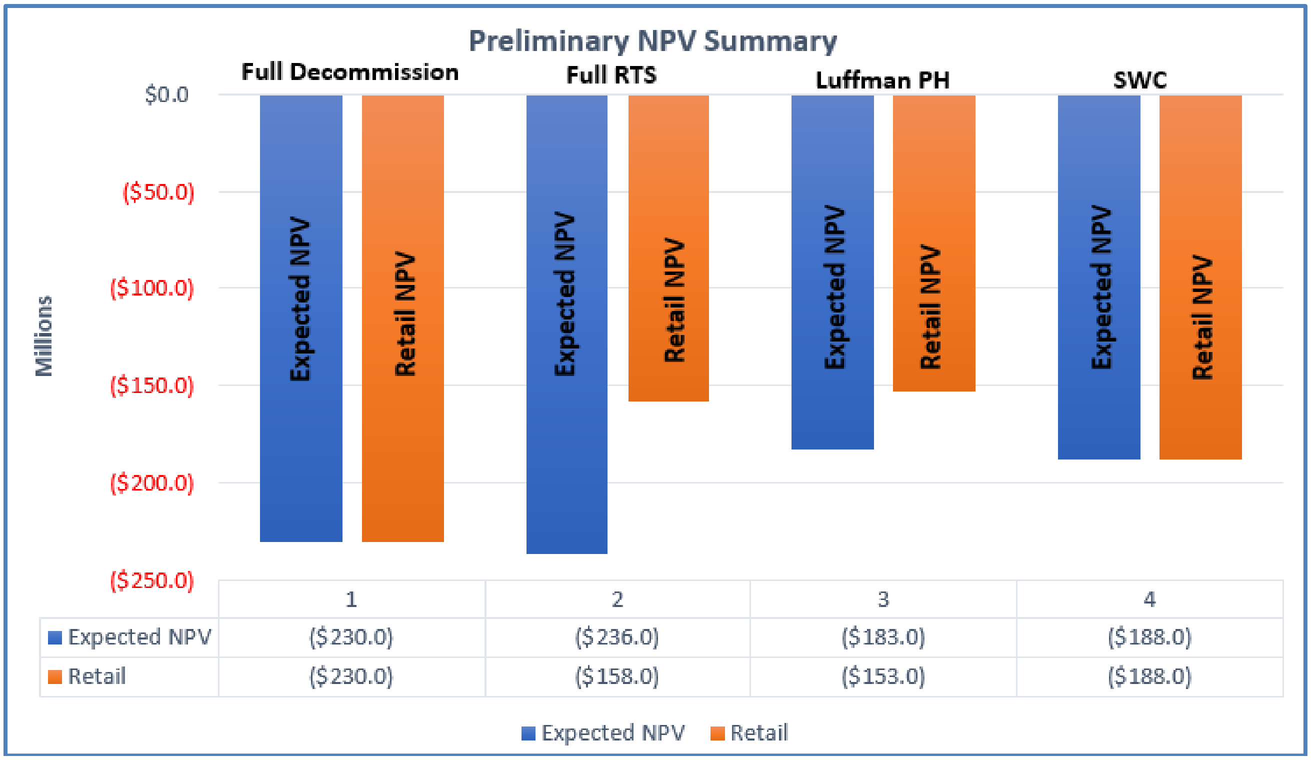


Chart 3: NPV Summary – Expected Wholesale Market Price NPV and Retail Price NPV

Table 6: NPV of Power Revenue Projections				
NPV – Power Revenue[1]	**Alternative 1 – Decommission to Pre-Project**	**Alternative 2 – RTS to Existing Power Plant**	**Alternative 3 – RTS to Power Plant at Luffman**	**Alternative 4 – Decommission to SWC**
Expected	$0	$21,100,000	$8,200,000	$0
High Market	$0	$41,700,000	$16,300,000	$0
Low Market	$0	$6,400,000	$2,500,000	$0
Retail	$0	$93,500,000	$36,500,000	$0

[1] Projected generation revenue based on the wholesale market prices through 2075

Table 7: NPV of Projected Ongoing Expenses				
NPV: Ongoing Expenses	**Alternative 1 – Decommission to Pre-Project**	**Alternative 2 – RTS to Existing Power Plant**	**Alternative 3 – RTS to Power Plant at Luffman**	**Alternative 4 – Decommission to SWC**
O&M	($31,600,000)	($46,500,000)	($42,800,000)	($37,100,000)
Capital	($4,600,000)	($13,100,000)	($10,200,000)	($9,000,000)

Table 8: NPV of Upfront Capital Expenses				
NPV: Upfront Capital Expenses	**Alternative 1 – Decommission to Pre-Project**	**Alternative 2 – RTS to Existing Power Plant**	**Alternative 3 – RTS to Power Plant at Luffman**	**Alternative 4 – Decommission to SWC**
Yearly Base Costs	($193,700,000)	($200,800,000)	($139,500,000)	($141,600,000)
Net Low Contingency	($135,600,00)	($140,600,000)	($97,600,000)	($99,100,000)
Net High Contingency	($290,600,000)	($301,200,000)	($209,200,000)	($212,400,000)

Sensitivity Considerations

Charts 4 through 6 depict additional sensitivity considerations, including:

- High Capital Cost / Low Wholesale Power Market Price
- Low Capital Cost / High Wholesale Power Market Price
- High Capital Cost / Low Capital Cost (-30% - +50%)
- Wholesale Power Value (High and Low Prices)
- Discount Rate (4% or 9%)
- Low Inflation / High Inflation (2% variation)

The tornado diagrams shown in Charts 5 and 6 indicate that the NPV results are most sensitive to the capital cost uncertainties and least sensitive to the power value uncertainties.

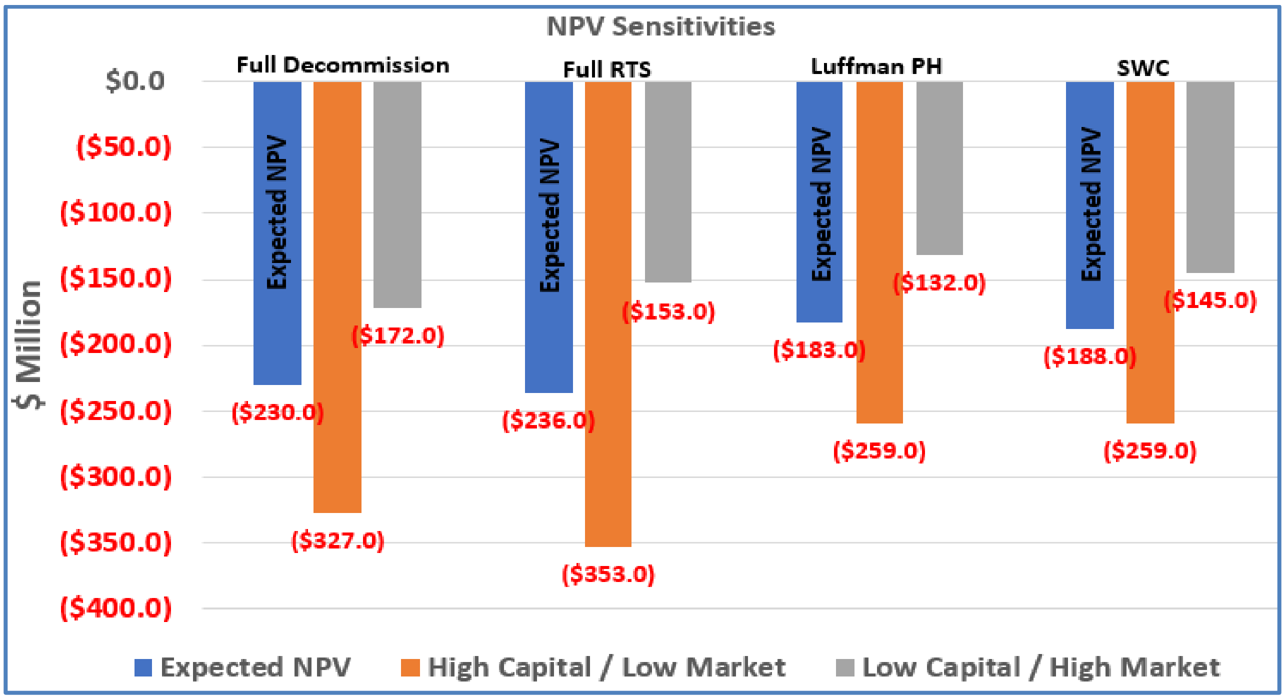


Chart 4: NPV Sensitivities – High Capital / Low Wholesale Markets and Low Capital / High Wholesale Markets

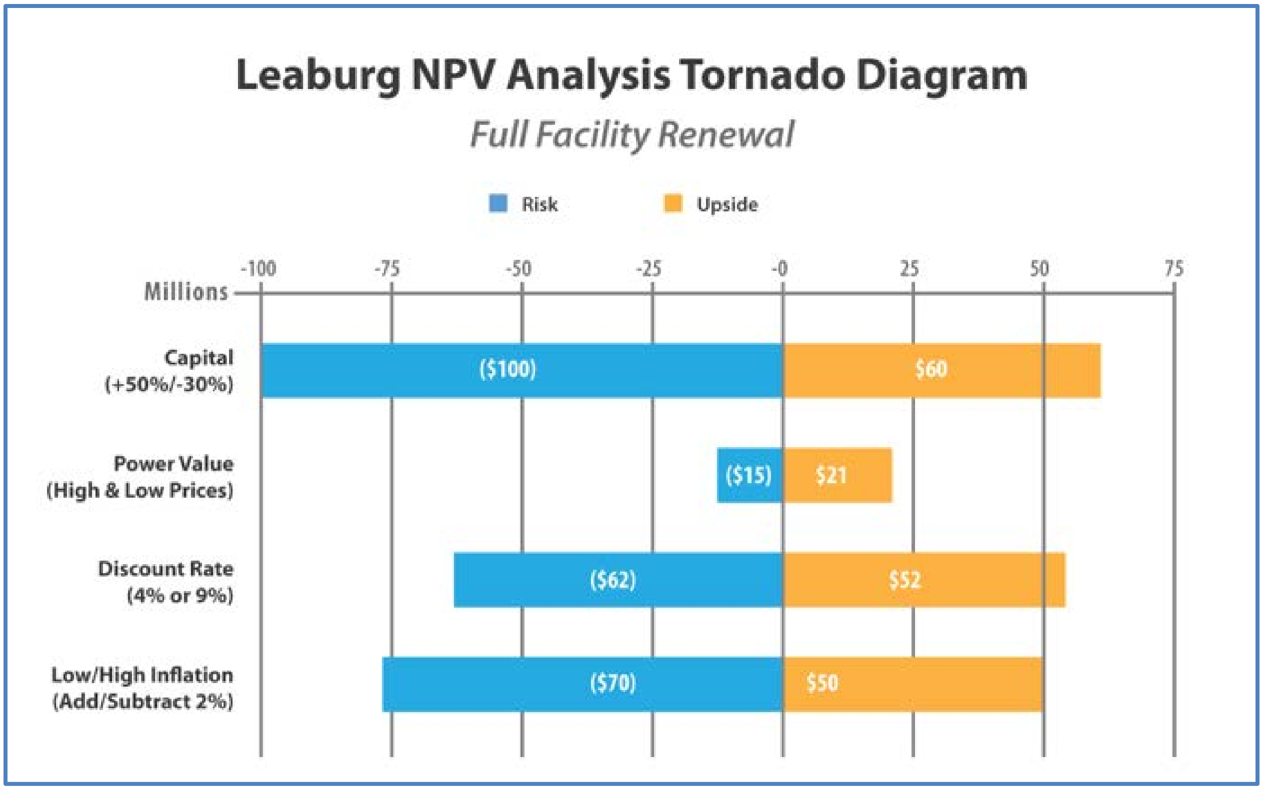


Chart 5: NPV Sensitivities for RTS – Full Facility Renewal, assuming Cougar Flow Regime

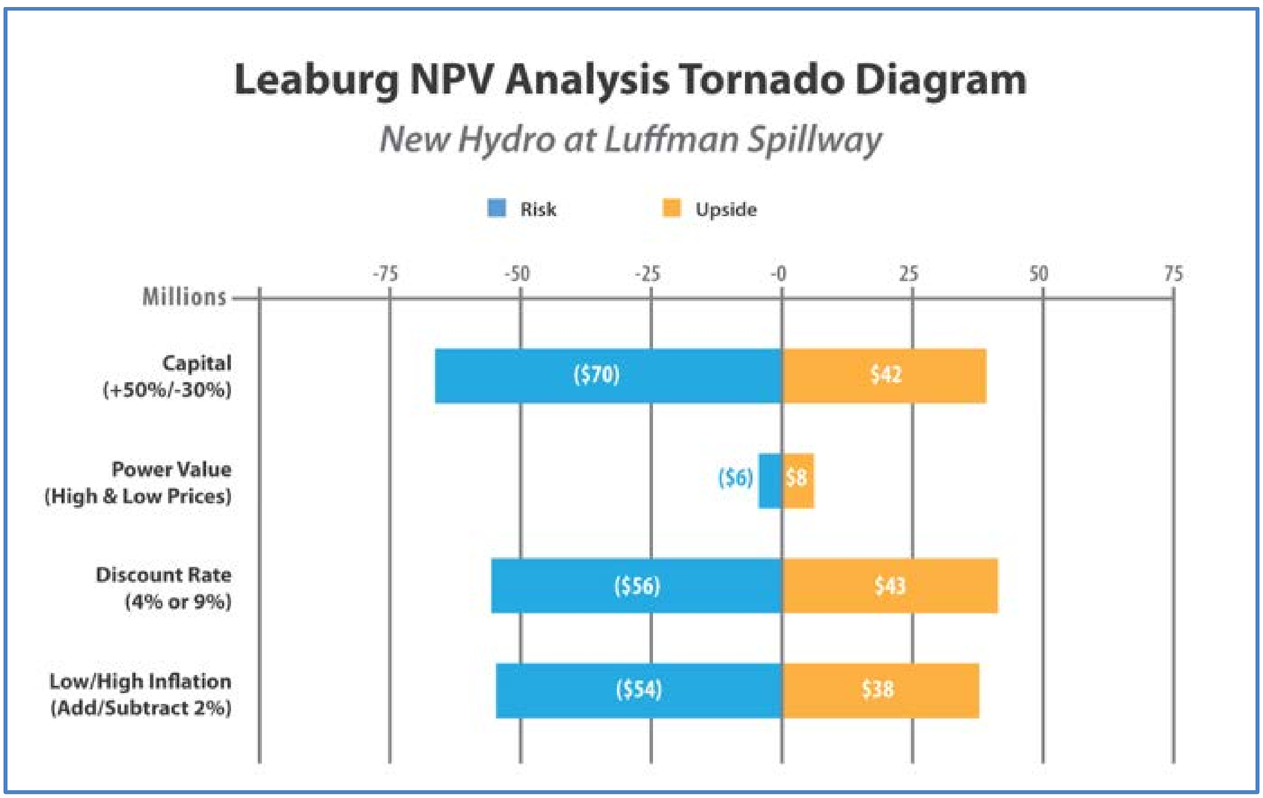


Chart 6: NPV Sensitivities for RTS – New Hydro Facility at Luffman Spillway, assuming Cougar Flow Regime

Forthcoming Replacement Power Considerations and Analysis
Using the latest version of the Leaburg NPV analysis, staff are now working to better understand and highlight the financial differences between alternatives from a variety of perspectives. This includes testing input assumptions and sensitivities, as well as developing additional metrics to complement initial NPV results. Complementary metrics may include an analysis of incremental costs, between generation and non-generation scenarios, to better understand the incremental cost of redeveloping generation at Leaburg, compared to EWEB's potential cost to develop a replacement resource. Such an analysis seeks to better inform whether foregoing further investment for generation at Leaburg could increase EWEB's exposure to more expensive portfolio alternatives that are outside the scope of this analysis. This analysis is currently in process and will be provided as correspondence for the September Board Meeting.

Forthcoming Sensitivity Analysis
There is additional sensitivity analysis still in process, to be provided as correspondence for the September Board Meeting. Those sensitivity analyses are expected to include the following topics:

- Return to Service assuming a 1,500 cfs in-stream flow requirement under a new FERC license. The current license requirement is 1,000 cfs.
- NPV effects of establishing a sinking fund to cover the cost of relicensing or decommissioning at the end of the estimated RTS license period (2076), if an RTS alternative is selected.
- Additional O&M Cost reductions if both Leaburg and Walterville projects were decommissioned.
- Effects on the NPV results from including renewable energy credit (REC) values, carbon values, and capacity values.

The additional sensitivity analysis will have impacts on the NPV and the rate trajectory needed to support the debt, which will be shown as part of the results.

Risk and Uncertainty
Each parameter of the financial analysis contains uncertainty. For example, capital cost estimates have an expected range of -30% to +50% from baseline. Given this, the NPV results should be considered preliminary until a focused and refined feasibility and design effort is completed after an alternative is selected. Additionally, although other assumptions used in the NPV and sensitivity analysis attempt to capture the myriad of uncertainty and risk associated with the following elements, several are outside of EWEB's control:

- Unknown and changing regulatory requirements
- Changing economic climate
- Future market prices and replacement power options
- Changes in available flow for power generation due to climate change or other factors

Because there is inherent risk in relying heavily on analysis that is based on many assumptions, variables, and uncertainty, the NPV analysis should be considered a tool to better understand the general outcome of the different alternatives rather than a conclusive instrument.

Rate Impacts
The financing requirements of any scenario, both in incremental capital and ongoing expenses, are expected to have a substantial impact on customer owner rates. Table 9 shows the projected incremental rate impact and incremental financing requirements for each alternative. Depending on the alternative selected, the Leaburg project expenses are expected to add an additional 11 to 23 percent during the period between 2023 and 2040. The Leaburg project would add approximately $238M - $355M to EWEB's financing needs during these periods.

Table 9: NPV Analysis – Project Compounded Rates and Incremental Financing				
NPV – Long-term Financial Plan Impacts	**Alternative 1 – Decommission to Pre-Project Conditions**	**Alternative 2 – RTS using Existing Power Plant Configuration**	**Alternative 3 – RTS with Power Plant at Luffman**	**Alternative 4 – Decommission to SWC**
Incremental Compounded Rates: 2023 - 2032	9.0%	6.5%	1.4%	5.1%
Incremental Compounded Rates: 2023 - 2040	23.0%	20.9%	11.4%	14.7%
Incremental Financing ($millions)	$335	$355	$238	$249

Preliminary Evaluation of Social Impacts

The following social impacts have been identified and are being evaluated as part of the TBL analysis. Further explanation and extent of impact will be provided in the October draft report.

Table 10: TBL- Social Impact Categories and Attributes	
Public Safety	• Landslides & Slope Stability • Canal Breach Flooding • Canal Water Hazards
Property Values	• Changes in Safety Risks • Recreational Amenities • Aesthetics
Fiscal Impacts	• Property Tax Revenues
Wildfire Response	• Firefighting Water Supply from Canal / Lake • Canal and Lake as Firebreak • Irrigation Water for Green Landscaping
Recreation	• Boating / Fishing on Leaburg Lake • Boating / Fishing on McKenzie River (below dam) • Hiking / Walking Canal Trails
Visual / Aesthetics	• Lake vs. River • Powerhouse vs No Powerhouse
Local Economic Activity	• Construction Phase • Operations Phase
Impacts to Domestic Wells	• Ground water
Surface Water Supplies	• EWEB Agreements
Tribal Resources	• Cultural Sites
Local Transportation Networks	• Construction Phase • Operations Phase
Noise Levels	• Construction Phase • Operations Phase
Historical Preservation	• Project Facilities are on the National Registry
Environmental Justice	• Impacts to Low-Income and Underserved Populations

Preliminary Evaluation of Environmental Impacts

The following environmental impacts have been identified and are being evaluated as part of the TBL analysis. Further explanation and extent of impact will be provided in the October draft report.

Table 11: TBL- Environmental Impact Categories and Attributes	
Carbon Footprint	• Construction Phase • Low-Carbon Electric Power Portfolio • Minimization of GHG Emissions

Water Quality – McKenzie River	• Turbidity / Sediments during Construction Phase • Turbidity / Sediments during Operations Phase • Temperature
Fishery	• Fish Migration • Habitat
Fish Hatcheries	• Water Supply
Lamprey	• Johnson Creek Silt Deposit Population • Leaburg Lake Silt Deposit Population
Wetland Acreage	• Local Losses • Build vs Purchase from Bank
Terrestrial / Avian Species	• Construction Phase • Operations Phase
Vegetation	• Extent of Removal • Extent of Planting

Public Outreach Update

The EWEB Communications team and project staff continue to inform the public about the status of the Leaburg Canal evaluation and are following the Communication and Stakeholder Engagement Strategy that was submitted to the Board in December 2021 (https://www.eweb.org/documents/board-meetings/2021/12-07-21/corr-leaburg-canal-communication-and-stakeholder-engagement-strategy.pdf). It should be noted that some minor changes were made to the original communications plan, such as substituting the "canal walks" with the "upriver listening sessions" as well as the timing of some items were adjusted to align with the pace of the project analysis. The project team also continues to receive periodic feedback from upriver community members via emails and calls, and a survey to gather feedback on potential impacts that was distributed to upriver community members in early June. A highlight of work completed to date includes:

- EWEB Employee News update – March 17, 2022
- Launch Leaburg Canal Strategic Evaluation Website – March 23, 2022
- Letter to Canal Neighbors providing current update – March 24, 2022
- Email update to river guides and irrigators – March 24, 2022
- Status update press releases to McKenzie River Reflections and Register Guard – April 6, 2022
- Social impact survey launched – June 15, 2022
- Update letter to Canal Neighbors providing an invitation to participate in the survey – July 1, 2022
- Upriver listening sessions commenced (4 completed to date)

Forthcoming and ongoing outreach includes:

- Bi-monthly upriver listening sessions
- Periodic advertisements and press releases in the McKenzie River Reflections
- Directed outreach to the local Tribal Community to be completed in August
- Notification of project status and social impact survey availability in September customer billing

- Monthly updates to the hatchery stakeholders (U.S. Army Corps of Engineers, NOAA Fisheries and Oregon Department of Fish & Wildlife)

Next Steps and Upcoming Project Milestones

- Update via Correspondence to Board – September 6, 2022
- Board Meeting - October 4, 2022: Summary of draft report
- Leaburg Canal Board Round Table Session – October 26, 2022
- Final Report from Consultant – November 2022
- Board Meeting - December 6, 2022: Final report and recommendation and Expected Board action
- Special Meeting/Work Session December 20, 2022 – TBD as needed

Requested Board Action

No Board action is requested at this time. We encourage questions, request feedback on approach, and welcome suggestions regarding ongoing work.

Appendix A

Alternative Scenario Descriptions

Description of Alternatives Selected for Further Consideration

The primary considerations that were used to select the alternatives for further evaluation are as follows:

- Upfront capital investment.
- Operational & maintenance (O&M) costs.
- Potential power generation revenues vs. investment and O&M costs.
- Likelihood of economic and regulatory feasibility.
- Flexibility to incorporate near-term canal modifications into long-term solution(s) with minimal re-work.
- Retention of hydroelectric generation water rights and the FERC operating license.
- Bookended alternatives that will help define the maximum base-line scenarios from cost, regulatory compliance, and complexity perspectives.

Alternative 1 - Decommission by returning the site to pre-construction conditions (Bookend Scenario): This alternative was selected for further evaluation and consists of returning the site to "pre-construction conditions" to the extent necessary to meet FERC decommissioning and all other regulatory requirements. The Project features, including the dam, canal, and power generating facilities would be entirely removed, and the pre-construction drainage patterns intercepted by the canal would be re-established. The consultant team estimates that there are 8 to 11 drainage pathways that would be routed directly to the river, many of which would require crossing Highway 126. A new access bridge would be required to be constructed in place of Leaburg Dam to provide access to the south side of the river.

Alternative 2 - Full facility restoration of existing power generation configuration (Bookend Scenario): This alternative was selected for further evaluation and consists of a "full facility renewal" to the extent necessary to meet FERC and all other regulatory requirements. The Project features, including the dam, canal intake, canal, and power generating facilities would be rehabilitated and remediated to meet required specifications. The rehabilitated canal embankment would include lining alternatives to reduce seepage and improve slope stability where necessary. Certain reaches, such as the Ames and Cogswell reaches, would be entirely removed and reconstructed to mitigate the identified seismic liquefaction and internal erosion issues. The canal would continue to function as a full-length power canal and the existing intake at the upstream end of the canal would be rehabilitated and maintained.

Alternative 3 - New powerhouse near the Luffman Spillway and conversion to stormwater conveyance downstream of the proposed powerhouse: This alterative was selected for further evaluation and consists of a new powerhouse constructed near the Luffman Spillway (1.25 miles downstream from Leaburg Dam), with rehabilitation of the upstream length of the canal to the new powerhouse. The canal downstream of the new Luffman Spillway powerhouse location would be remediated to allow for stormwater conveyance. Due to identified seismic stability and seepage issues, certain reaches like the Cogswell and Ames reaches would be modified to provide adequate stability for stormwater conveyance. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained.

Alternative 4 - Decommissioning with a combination of stormwater conveyance and return to pre-construction conditions: This alternative includes construction of a new spillway at Johnson Creek and modifications to the Luffman spillway. The canal downstream of Luffman spillway would be modified to allow for tributary isolation and stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. Leaburg Dam would be removed, and the McKenzie River would be restored to a "pre-construction" configuration. A new access bridge would replace Leaburg Dam to provide access to the south side of the river. This alternative is a flexible option that converts short-term risk reduction measures that are under consideration into a long-term solution.

Description of Alternatives Not Selected for Further Consideration

In addition to the primary considerations identified above for the selected alternatives, the following issues were also considered when determining which alternatives will not be further evaluated:

- The certainty that doing nothing would be unacceptable to EWEB, the public, and all regulatory stakeholders.
- The presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek which would require extensive mitigation.
- The limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.
- The high uncertainty of accomplishing intergovernmental partnerships for funding, obtaining the necessary non-hydroelectric water rights, and successfully completing a jurisdictional transfer of the canal to another entity for use as an environmental amenity.
- The high likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

Do Nothing: Taking no action and leaving the project facilities in their current condition was not selected as an alternative for further evaluation because risk assessment results indicate a safety hazard exists that must be remedied. The no action alternative does not meet the requirements of EWEB organizational goal #3 to *work in collaboration with the Board and the McKenzie Valley Community to set the direction of the* ***Leaburg Hydro Electric Project*** *toward either a safe and reliable power producing asset or a safe and reliable stormwater conveyance asset.*

New powerhouse at Luffman Spillway and canal returned to pre-construction conditions downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Luffman Spillway (Sta. 66+00), with rehabilitation of the upstream length of the canal to the new powerhouse and full decommissioning of the canal length downstream of the new powerhouse. The portion of canal extending downstream of the newly constructed powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, prior to construction, and the pre-construction drainage patterns intercepted by the canal would be re-established. There are 6 to 9 drainage pathways that would be routed directly to the river, many of which would require crossing Highway 126. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the high likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

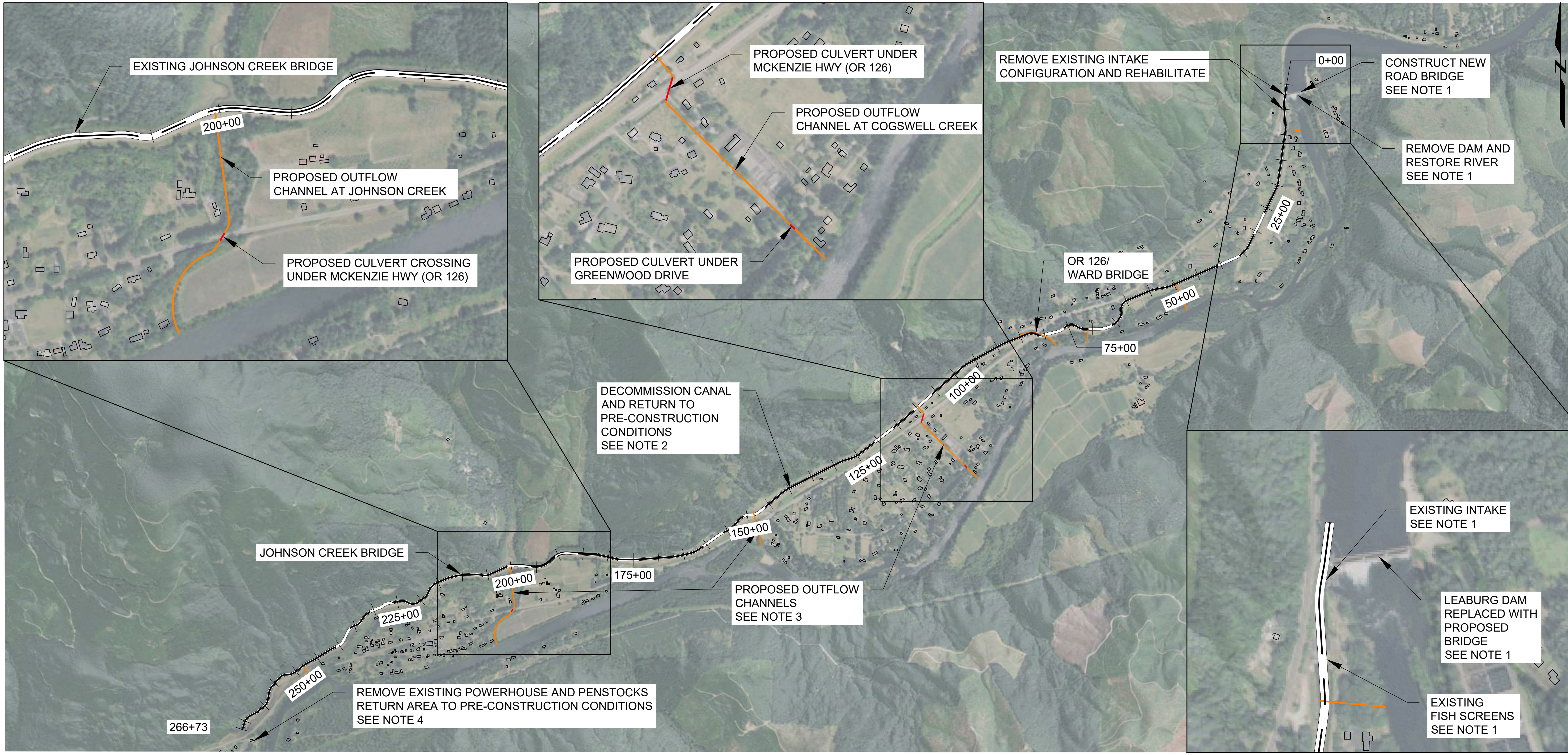
New powerhouse at Hansen Creek and stormwater conveyance downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Hansen Creek (Sta 151+60), with rehabilitation of the upstream length of the canal to the new powerhouse. The canal downstream of the new powerhouse will remain in service to allow for stormwater conveyance. The rehabilitated canal embankment upstream of the new powerhouse at Sta 151+60 would include lining alternatives to reduce seepage and improve slope stability. The portion of canal extending downstream of the newly constructed powerhouse would be maintained to be used for stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. The Cogswell Reach would be reconstructed and lined upstream of the new powerhouse. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek which would require extensive mitigation.

New powerhouse at Hansen Creek and canal returned to pre-construction conditions downstream of the proposed powerhouse: This alternative consists of a new powerhouse constructed at Hansen Creek (Sta 151+60), with rehabilitation of the upstream length of the canal to the new powerhouse. The portion of canal extending downstream of the newly constructed powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, and the pre-construction drainage patterns intercepted by the canal would be re-established. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the presence of significant slope instability and potential land-slide risk near the prospective powerhouse location at Hansen Creek, which would require extensive mitigation, as well as the likelihood that long term use of portions of the canal system for stormwater conveyance will be regulatorily acceptable/preferred over returning the Project to pre-construction conditions.

Close-coupled powerhouse at Leaburg Dam with stormwater conveyance downstream of the proposed powerhouse: This alternative consists of a new close-coupled powerhouse constructed at Leaburg Dam, with rehabilitation of the immediate upstream length of the canal to the new powerhouse. The remaining portion of the canal downstream of the new powerhouse will be modified to allow for stormwater conveyance. Due to identified seismic stability and seepage issues, the Cogswell and Ames reaches would be modified to provide adequate stability in those reaches for stormwater conveyance. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.

Close-coupled powerhouse at Leaburg Dam with canal returned to pre-construction conditions downstream of proposed powerhouse: This alternative consists of a new close-coupled powerhouse constructed at Leaburg Dam and decommissioning of the canal length downstream of the new powerhouse. The portion of canal extending downstream of the newly constructed close-coupled powerhouse would be entirely decommissioned, i.e. cut and filled to match the grade adjacent to the canal, to the extent possible, prior to construction. A drainage plan would be developed for this alternative to allow for previous runoff into Leaburg Canal to return to the McKenzie River. There are 8 to 11 drainage pathways that would be routed directly to the river for this alternative, many of which would require crossing Highway 126. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be rehabilitated and maintained. This alternative was not selected due to the limited power production revenues vs. overall investment and O&M cost for the close-coupled power generation alternatives.

Canal converted into an environmental amenity: This alternative consists of the canal being converted into an environmental amenity through removing the existing powerhouse and penstocks and rehabilitating portions of embankment along the length of the canal. The existing powerhouse and penstocks located at the end of Leaburg Canal would be removed or decommissioned. The remaining existing canal would be maintained to continue to route runoff and convey a limited amount of flow from the McKenzie River (less than 100 cfs compared to up to 2,500 cfs for power generation). Due to identified seismic stability and seepage issues, certain reaches such as the Cogswell and Ames reaches would be removed and reconstructed to provide adequate stability. No lining alternatives would be constructed within the canal. Leaburg Dam would be maintained to continue controlling Leaburg Lake at current levels. The existing intake at the upstream end of the canal would be modified for the proposed use as a low flow diversion. This alternative would allow for continued water conveyance to the McKenzie fish hatchery and irrigators as well as other environmental uses of the canal, such as serving as a fish rearing habitat and possibly spawning habitat. This alternative would require a highly unlikely permanent transfer of the canal to a partnering State or Federal agency for ongoing operation and maintenance. This alternative was not selected due to the high uncertainty of accomplishing intergovernmental partnerships for funding, obtaining the necessary non-hydroelectric water rights, and successfully completing a jurisdictional transfer of the canal to another entity for use as an environmental amenity.



NOTES:

DECOMMISSION THE PROJECT THROUGH EARTHWORK, PERFORMING CUT AND FILL OF THE CANAL TO RETURN THE SITE TO PRE-PROJECT CONDITIONS. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. REMOVE EXISTING LEABURG DAM AND ASSOCIATED INFRASTRUCTURE. CONSTRUCT NEW BRIDGE IN SAME LOCATION.
2. RE-GRADE THE ENTIRE LENGTH OF THE CANAL THROUGH EXCAVATION OF THE EMBANKMENT AND FILLING OF THE CANAL. MATCH PRE-PROJECT CONDITIONS OF THE SURROUNDING AREA. REFERENCE DETAIL G-1 ON FIGURE 5.
3. CONSTRUCT PROPOSED OUTFLOW CHANNELS AT SPECIFIED LOCATIONS TO RETURN TRIBUTARY FLOW FROM ADJACENT WATERSHEDS TO THE MCKENZIE RIVER.
4. REMOVE THE EXISTING POWERHOUSE AND PENSTOCKS.

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

0 2000 4000

SCALE: 1" = 2000'

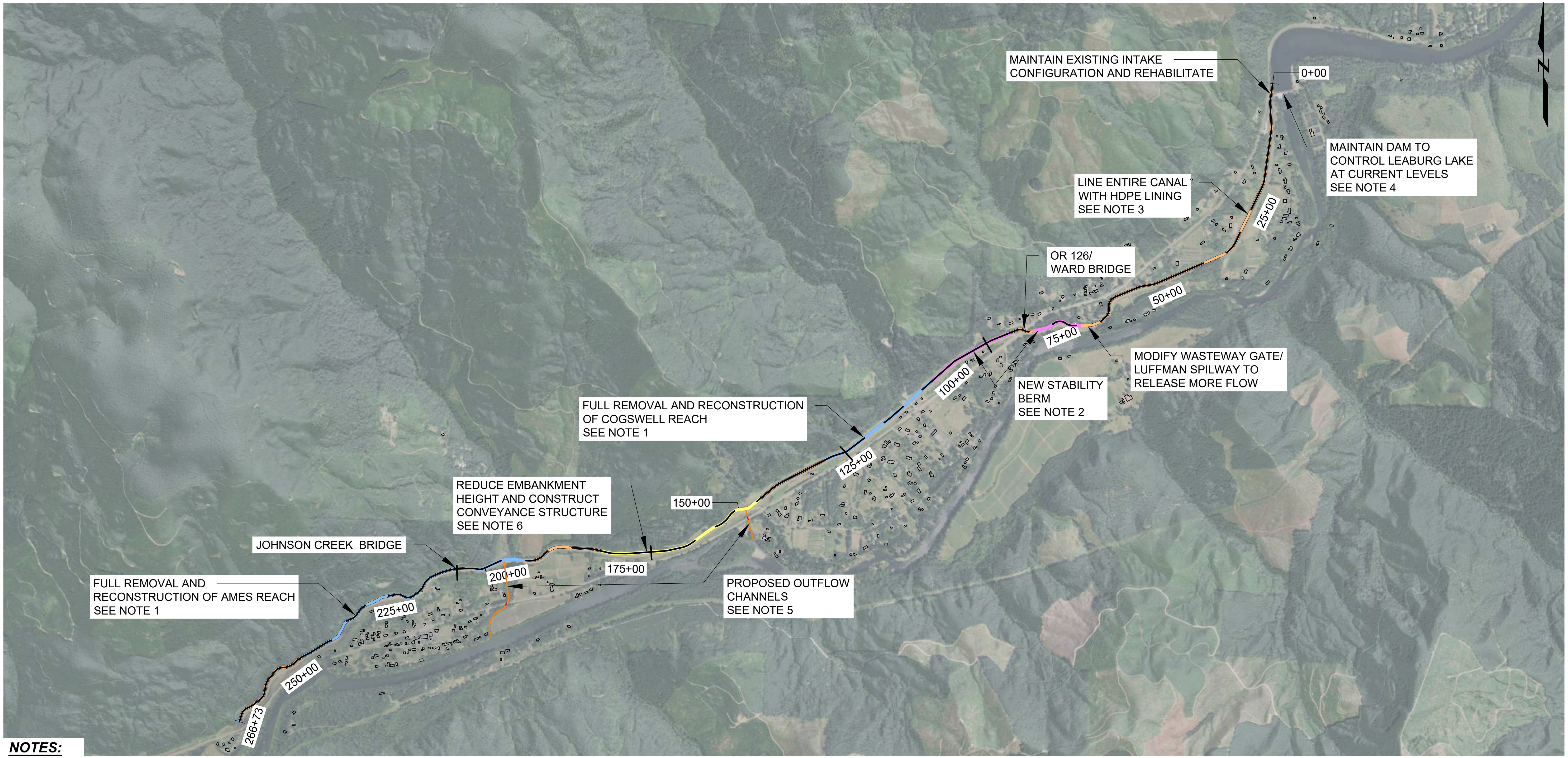
LEGEND:

FULL CANAL REMOVAL - CUT AND FILL TO MATCH SLOPE OF VALLEY (PRE-PROJECT CONDITIONS)

Not Issued for Construction

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 1 RETURN SITE TO PRECONSTRUCTION
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 1

HOLMSTEAD, ERIC B:\Working\EUGENE WATER & ELECTRIC BOARD\2104273 Strategic Eval_Leaburg-Walterville Hydro Project\00_CAD\Figures\04_Preferred Alternatives\Alternative 1.dwg - 6/6/2022



NOTES:

REMEDIATE THE PROJECT THROUGH THE RECONSTRUCTION OF SPECIFIC REACHES EXHIBITING SLOPE INSTABILITY AND LINING OF THE CANAL TO IMPROVE OVERALL SEEPAGE CONCERNS. MODIFICATIONS FOR THIS ALTERNATIVE INCLUDE:

1. FULLY REMOVE AND RECONSTRUCT THE CANAL FOR THE AMES AND COGSWELL REACHES TO ADDRESS INTERNAL EROSION AND SLOPE STABILITY ISSUES. DENOTED BY THE BLUE PORTIONS OF THE CANAL.
2. CONSTRUCT A STABILITY BERM TO ADDRESS STABILITY CONCERNS ALONG PORTIONS OF THE EMBANKMENT THAT WILL NOT BE RECONSTRUCTED
3. LINE THE ENTIRE LENGTH OF THE CANAL WITH HIGH DENSITY POLYETHYLENE (HDPE) LINER COVERED WITH SHOTCRETE. REFERENCE DETAIL G-2 ON FIGURE 5 AND FIGURE 7. SECTION WITH NEW CONCRETE CONVEYANCE WILL NOT BE LINED WITH HDPE AND SHOTCRETE, SEE NOTE 6.
4. MAINTAIN EXISTING LEABURG DAM, CANAL INTAKE CONFIGURATION, AND EXISTING POWERHOUSE IN ORDER TO CONTINUE OPERATING THE MCKENZIE RIVER AT CURRENT LEVELS.
5. CONSTRUCT PROPOSED OUTFLOW CHANNELS AT SPECIFIED LOCATIONS TO RETURN FLOW TO THE MCKENZIE RIVER.
6. REDUCE EMBANKMENT HEIGHT AND CONSTRUCT CONCRETE CONVEYANCE STRUCTURE WITH SAME INVERT AS EXISTING CANAL. SEE DETAIL G-7 ON FIGURE 6

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

LEGEND:

- INSTALL HDPE LINING
- FULL REMOVAL AND RECONSTRUCTION WITH SHALLOWER EMBANKMENT SLOPE AND HDPE LINING
- REDUCE EMBANKMENT HEIGHT AND CONSTRUCT CONCRETE CONVEYANCE STRUCTURE
- CONSTRUCT STABILITY BERM AND INSTALL HDPE LINING

Not Issued for Construction

0 2000 4000

SCALE: 1" = 2000'

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 2 FULL FACILITY RENEWAL
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 2

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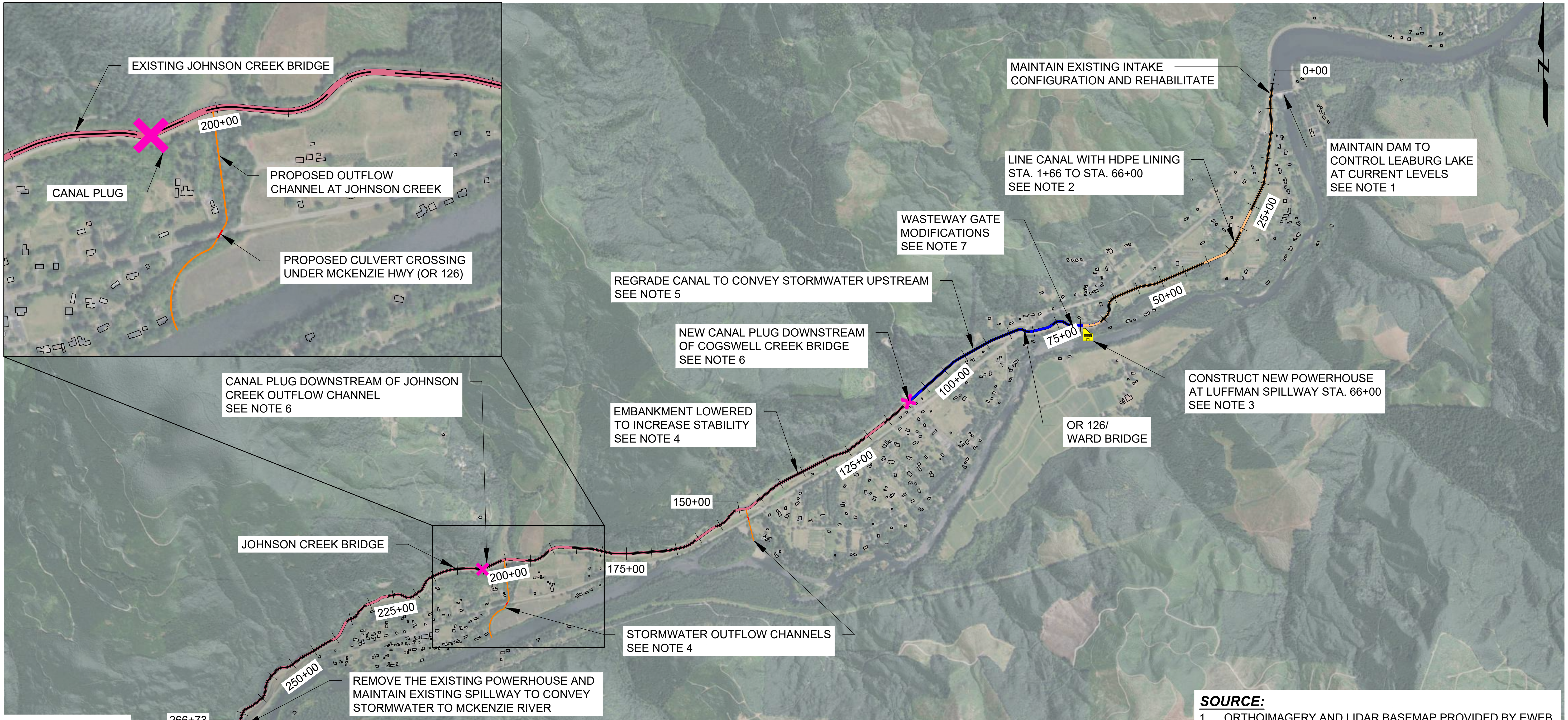

NOTES:

RETURN THE PROJECT TO SERVICE WITH A NEW POWERHOUSE AT LUFFMAN SPILLWAY. MAINTAIN THE DOWNSTREAM CANAL FOR STORMWATER CONVEYANCE, AND REMEDIATE THE EXISTING CANAL EXHIBITING SLOPE INSTABILITY BY LOWERING THE EMBANKMENT. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. MAINTAIN EXISTING LEABURG DAM AND CANAL INTAKE CONFIGURATION.
2. LINE THE EFFECTIVE LENGTH OF THE CANAL UP TO THE PROPOSED LUFFMAN SPILLWAY POWERHOUSE WITH HIGH DENSITY POLYETHYLENE (HDPE) LINER COVERED WITH SHOTCRETE. REFERENCE DETAIL G-2 ON FIGURE 5 AND FIGURE 7.
3. CONSTRUCT A NEW POWERHOUSE AT LUFFMAN SPILLWAY. REFERENCE DETAIL G-4 ON FIGURE 5..
4. REDUCE THE EMBANKMENT HEIGHT AND MAINTAIN THE PORTION OF THE CANAL DOWNSTREAM OF THE PROPOSED POWERHOUSE FOR STORMWATER CONVEYANCE FOR FLOWS UP TO THE 10,000 YEAR FLOOD (DETAIL G-6 ON FIGURE 6) AND CONSTRUCT STORMWATER OUTFLOWS AT JOHNSON CREEK AND HANSEN CREEK .
5. REGRADE COGSWEL REACH UPSTREAM OF COGSWELL CREEK TO DISCHARGE AT THE WASTEWAY GATE.
6. CONSTRUCT A CANAL PLUG AT JOHNSON CREEK AND COGSWELL CREEK TO SEGREGATE STORMWATER CONVEYANCE FLOW WITHIN THE CANAL.
7. IMPLEMENT MODIFICATIONS TO THE WASTEWAY GATE AND LUFFMAN SPILLWAY IN ORDER TO RELEASE STORM FLOWS FROM COGSWELL CREEK.

0 2000 4000

SCALE: 1" = 2000'

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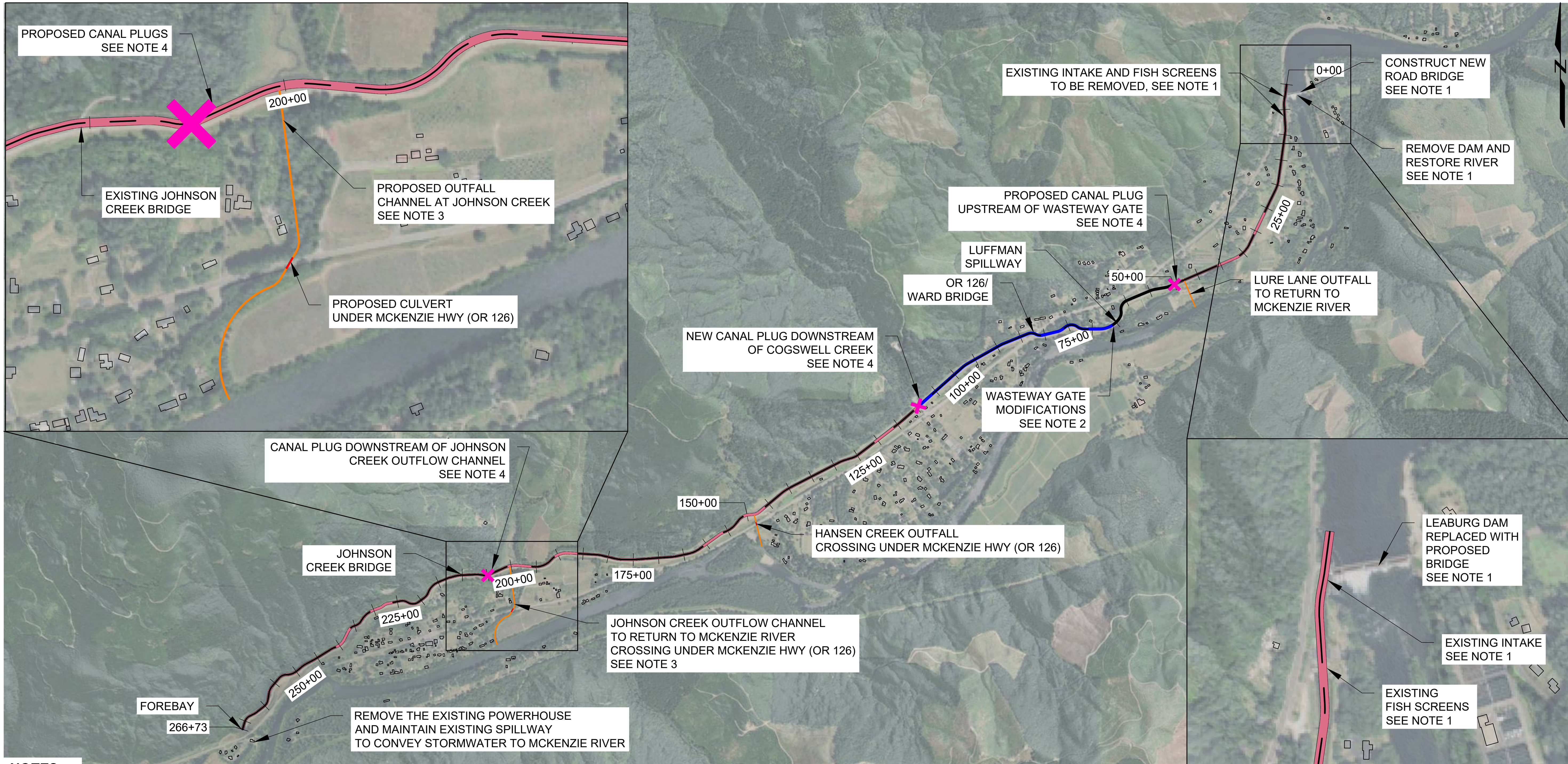
LEGEND:

	INSTALL HDPE LINING
	EMBANKMENT LOWERED AND CANAL UTILIZED AS STORMWATER CONVEYANCE. PROPOSED EMBANKMENT HEIGHT SUFFICIENT TO CONVEY 10,000 YEAR FLOOD WITH 2' OF FREEBOARD
	CANAL GRADING TO DIVERT RUNOFF UPSTREAM TOWARDS NEW POWERHOUSE

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 3 LUFFMAN SPILLWAY POWER-HOUSE & DOWNSTREAM RECONSTRUCTION
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 3



NOTES:

DECOMMISSION THE PROJECT THROUGH A COMBINATION OF CHANGES, INCLUDING LOWERED EMBANKMENT, PROPOSED STORMWATER CONVEYANCE, AND RETURNING THE SITE TO PRE-PROJECT CONDITIONS. MODIFICATIONS REQUIRED FOR THIS ALTERNATIVE INCLUDE:

1. REMOVE EXISTING LEABURG DAM AND ASSOCIATED INFRASTRUCTURE,AND BUILD A NEW BRIDGE IN PLACE OF THE EXISTING DAM.
2. IMPLEMENT MODIFICATIONS TO THE WASTEWAY GATE AND LUFFMAN SPILLWAY IN ORDER TO RELEASE STORM FLOWS FROM COGSWELL CREEK.
3. REDUCE THE EMBANKMENT HEIGHT AND MAINTAIN THE CANAL FOR STORMWATER CONVEYANCE FOR FLOWS UP TO THE 10,000 YEAR FLOOD (DETAIL G-6 ON FIGURE 6) AND CONSTRUCT STORMWATER OUTFLOWS AND JOHNSON CREEK AND HANSEN CREEK.
4. CONSTRUCT A CANAL PLUG AT JOHNSON CREEK, COGSWELL CREEKK, AND WASTEWAY GATE TO SEGREGATE STORMWATER CONVEYANCE FLOW WITHIN THE CANAL.

SOURCE:

1. ORTHOIMAGERY AND LIDAR BASEMAP DATA PROVIDED BY EWEB.

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0 2000 4000

SCALE: 1" = 2000'

LEGEND:

CANAL GRADING TO DIVERT RUNOFF UPSTREAM TOWARDS MODIFIED WASTEWAY GATE

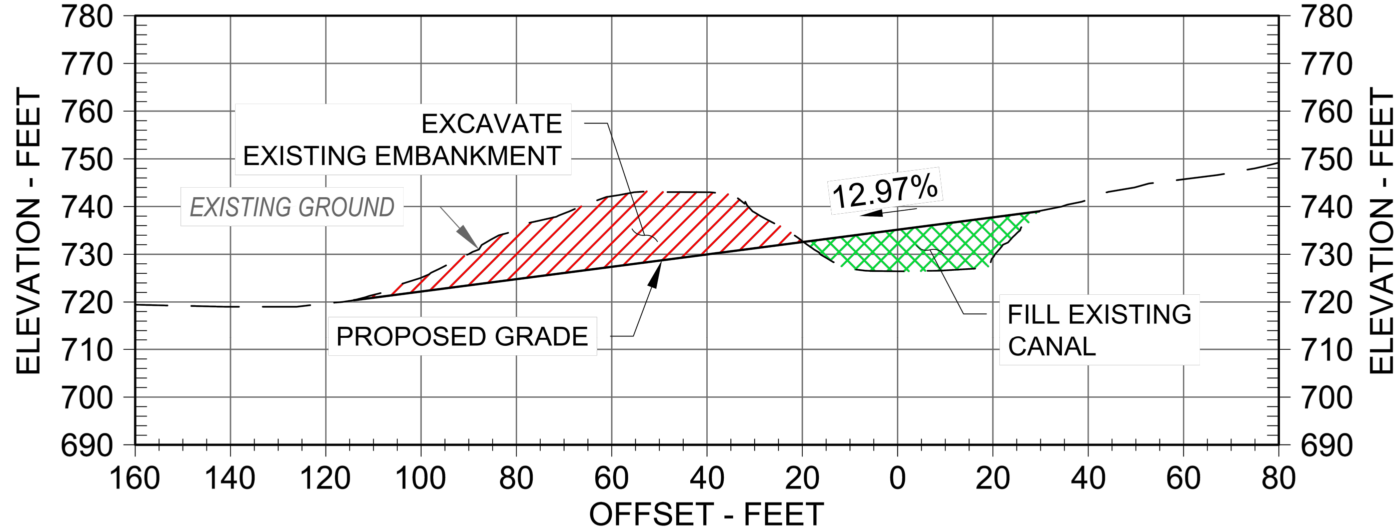
EMBANKMENT LOWERED AND CANAL TO BE UTILIZED AS STORMWATER CONVEYANCE. PROPOSED EMBANKMENT HEIGHT SUFFICIENT TO CONVEY 10,000 YEAR FLOWS WITH 2' OF FREEBOARD

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	ALTERNATIVE 4 NEW SPILLWAY AT JOHNSON CREEK AND WASTEWAY GATE MODIFICATIONS
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 4

HOLMSTEAD, ERIC B:\Working\EUGENE WATER & ELECTRIC BOARD\2104273 Strategic Eval_Leaburg-Walterville Hydro Project\00_CAD\Figures\04_Preferred Alternatives\Alternative 4 - Canal Plugs.dwg - 6/6/2022

EXAMPLE EXCAVATION/FILL SECTION

80+00



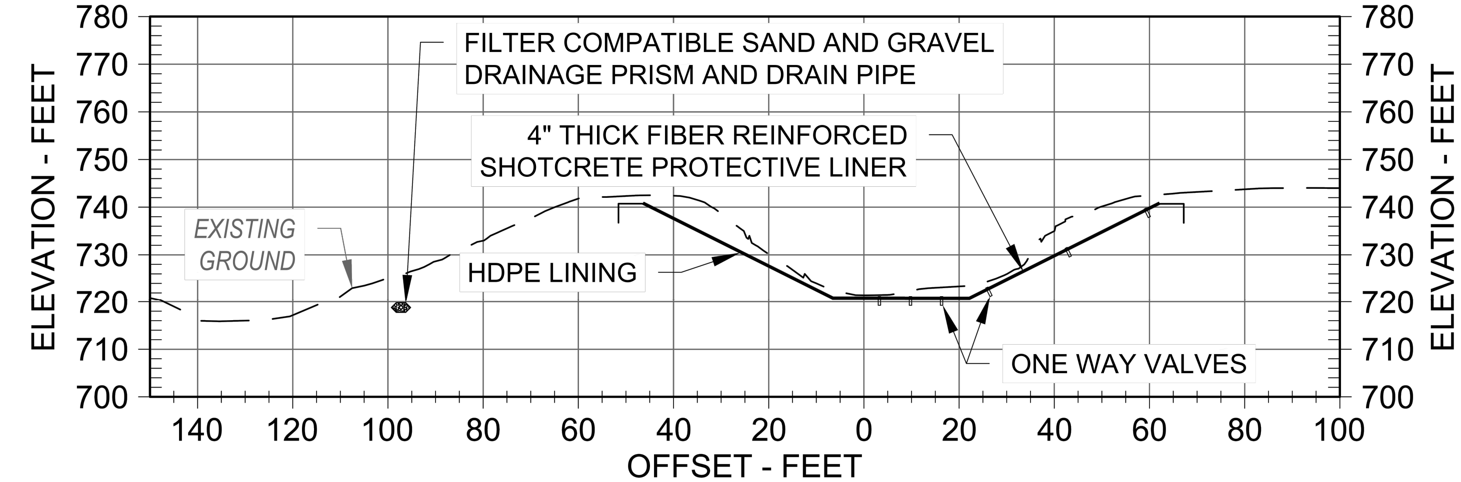
G 1 TYPICAL SECTION

STA. 80+00 - DECOMMISSION CANAL

0 40 80

SCALE, FEET

EXAMPLE HDPE LINING SECTION



G 2 TYPICAL SECTION

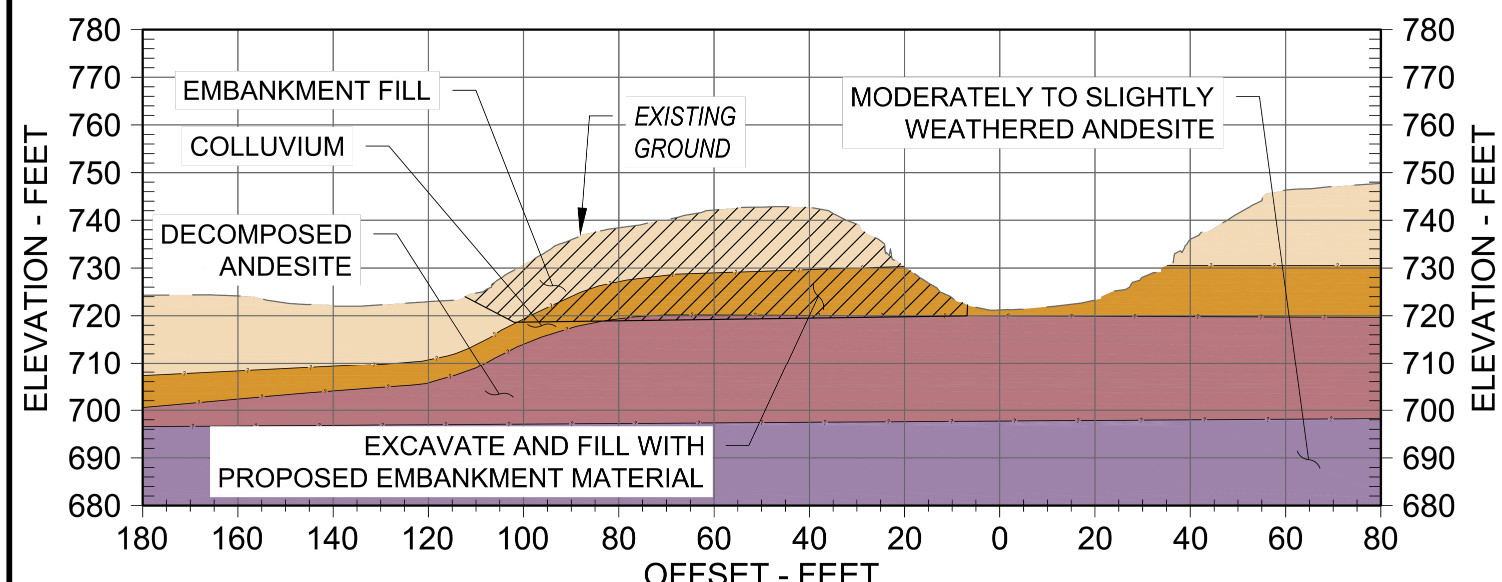
STA. 121+50 - HDPE & SHOTCRETE LINING

SEE FIGURE 7 FOR ADDITIONAL DETAILS

0 40 80

SCALE, FEET

EXAMPLE EMBANKMENT RECONSTRUCTION SECTION

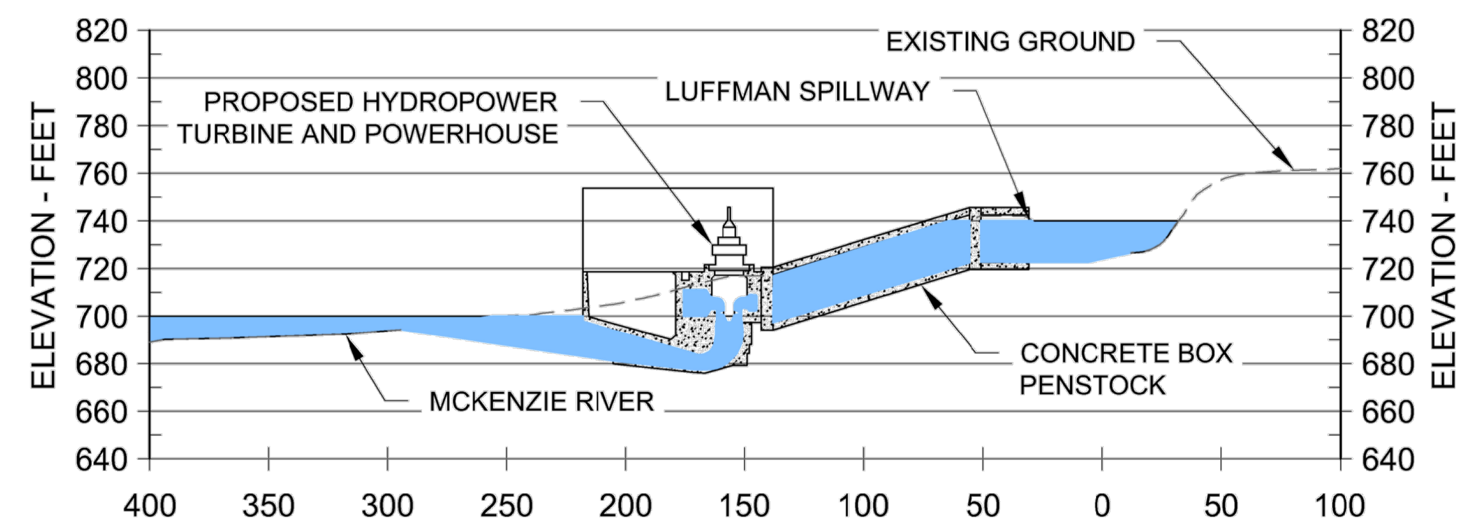


G 3 TYPICAL SECTION

0 40 80

SCALE, FEET

NEW LUFFMAN POWERHOUSE



G 4 LUFFMAN SPILLWAY

SCALE: 1:1 V:H

Not Issued for Construction

1. ALL SECTIONS ORIENTED LOOKING DOWNSTREAM
2. GEOLOGIC DATA SHOWN IS EXTRACTED AND MODIFIED FROM "AMES STABILITY EVALUATION REPORT" AND "COGSWELL CREEK SEEPAGE AND STABILITY EVALUATION REPORT" (CORNFORTH CONSULTANTS, 2020). GEOLOGIC UNIT EXTENTS ARE APPROXIMATE AND WILL VARY ALONG THE ALIGNMENT.

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	PREFERRED ALTERNATIVE TYPICAL SECTIONS 1
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 5

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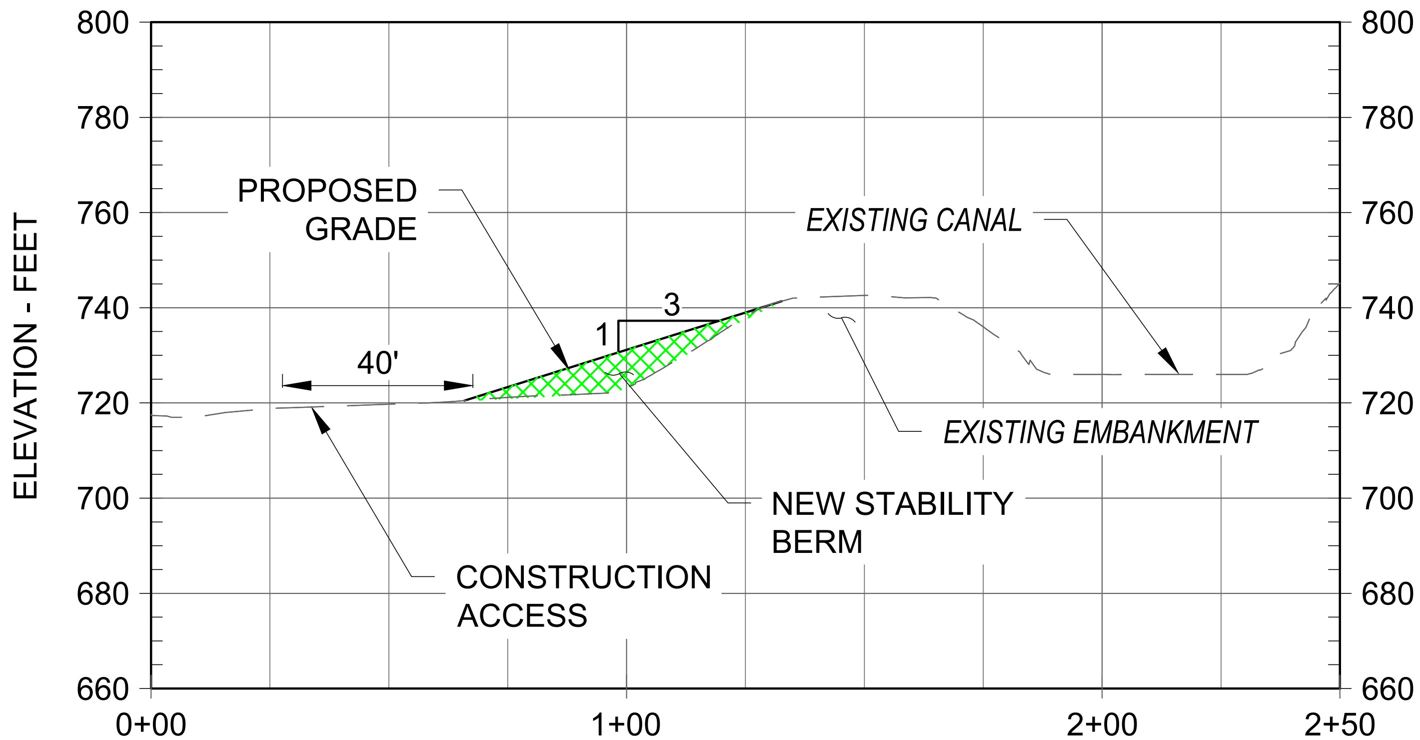
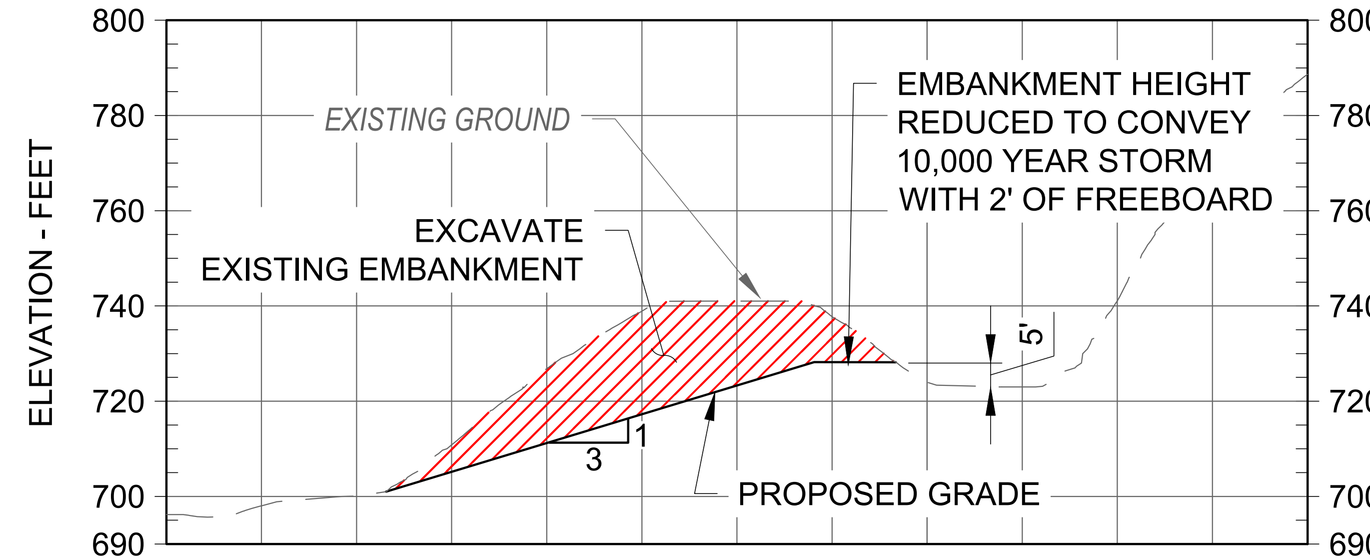
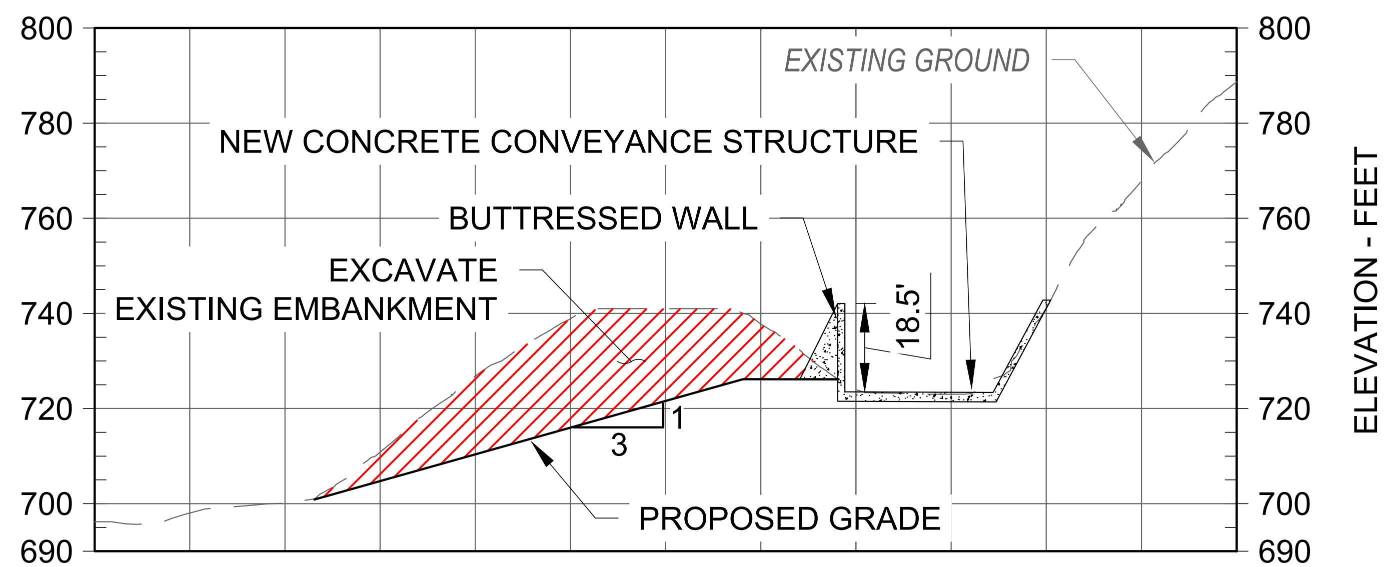


G 5 TYPICAL STABILITY BERM SECTION
STA. 90+00



G 6 TYPICAL STORM WATER DIVERSION SECTION
STA. 155+00



G 7 LOWERED EMBANKMENT WITH CONVEYANCE STRUCTURE
STA. 155+00

0 40 80
SCALE, FEET

NOTE:
1. ALL SECTIONS ORIENTED LOOKING DOWNSTREAM

Not Issued for Construction

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	PREFERRED ALTERNATIVES TYPICAL SECTIONS 2
Eugene Water & Electric Board Eugene, OR	Project 2104273	June 2022 Fig. 6

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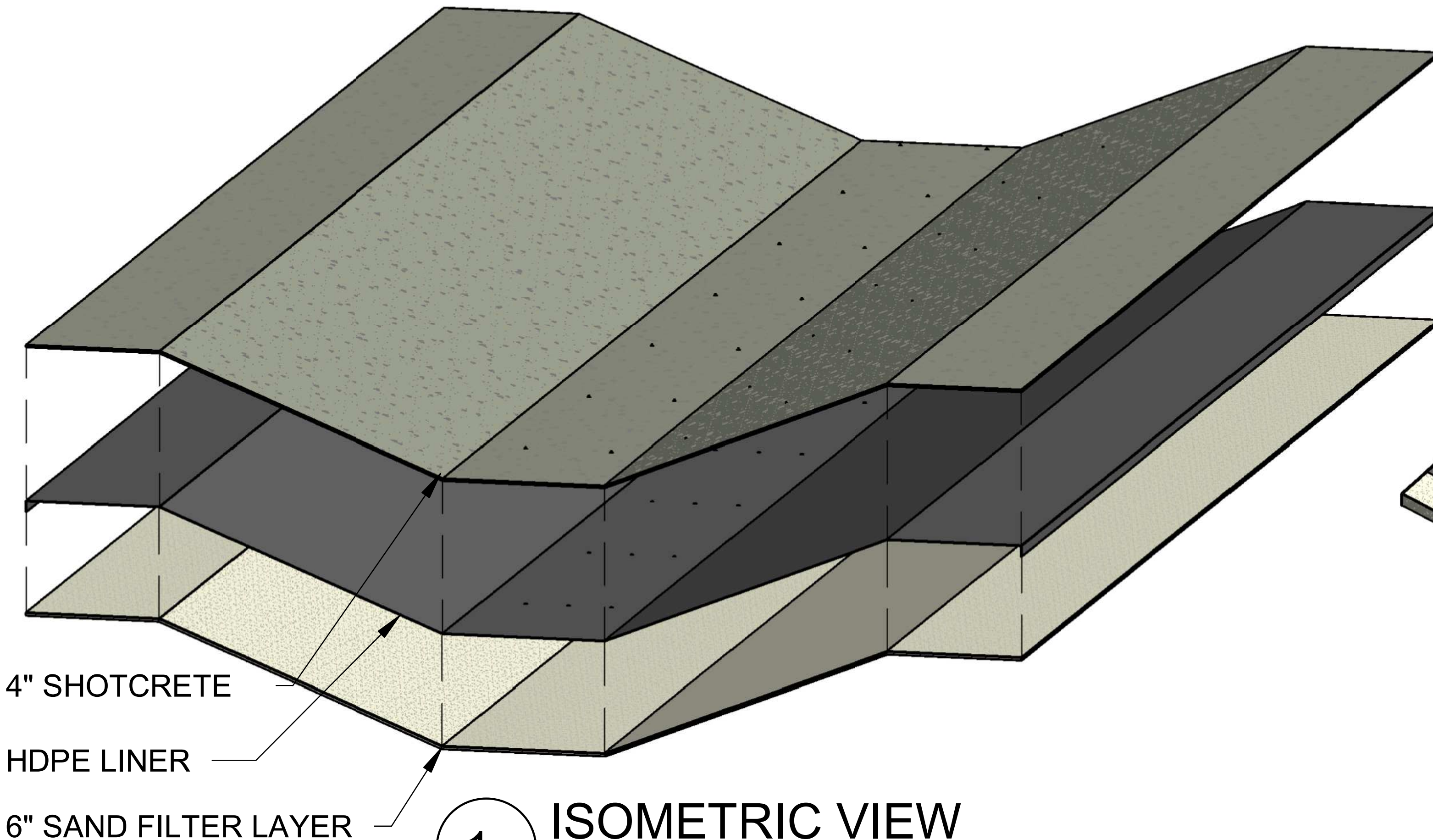
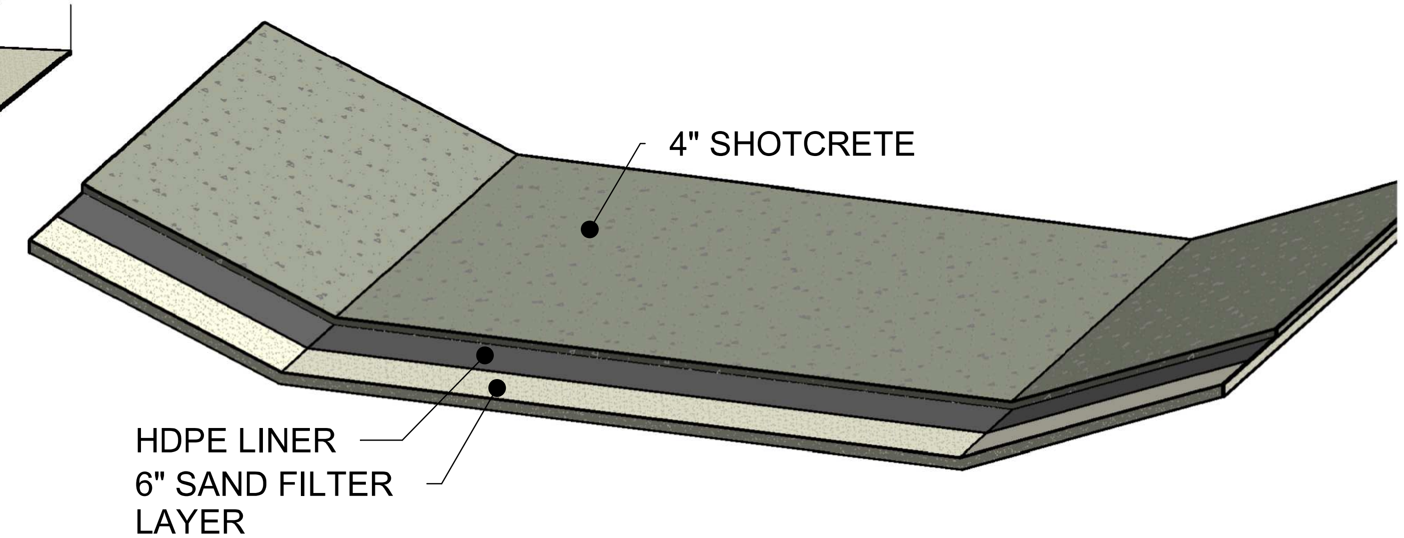
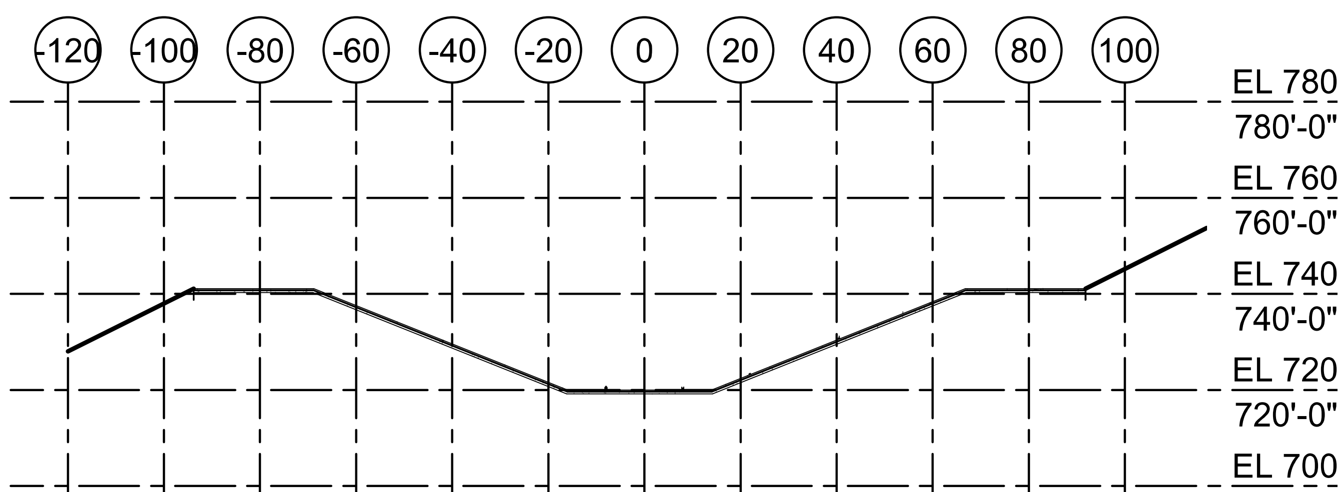


1 ISOMETRIC VIEW

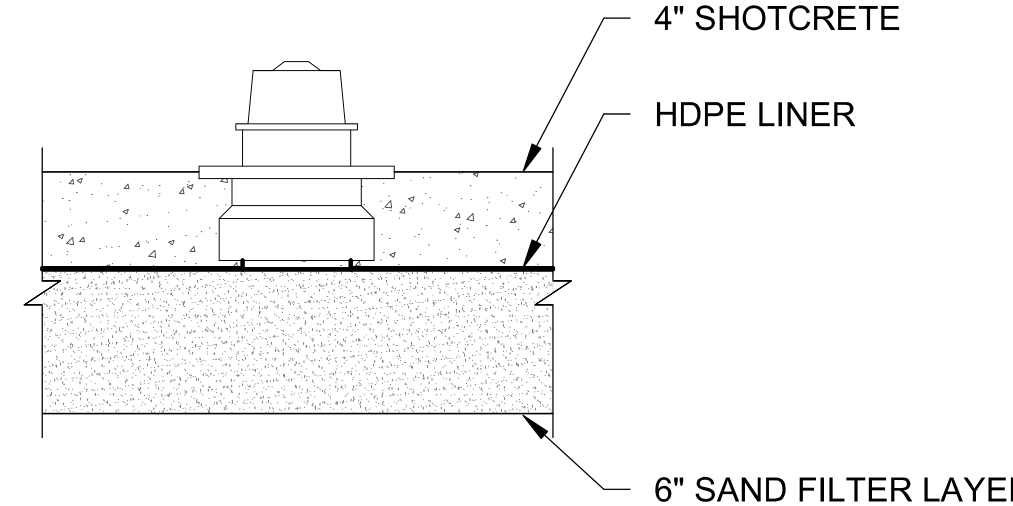


2 ISOMETRIC VIEW



SECTION

SCALE: 1" = 40'-0"



3 DRAIN SECTION

SCALE: 1 1/2" = 1'-0"

Strategic Evaluation of Leaburg-Walterville Hydroelectric Project Leaburg, OR	GEI Consultants	SHOTCRETE AND HDPE LINING DETAIL
Eugene Water & Electric Board	PROJECT 2104273	June 2022 Fig. 7